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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
ULM, JOHN D	
ART UNIT	PAPER NUMBER

1646

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Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**Application No.  
**09/759,152**

Applicant(s)

**Palmer et al.**

Examiner

**John Ulm**

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**1646***-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --***Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**1)  Responsive to communication(s) filed on Apr 19, 20022a)  This action is FINAL.      2b)  This action is non-final.3)  Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.**Disposition of Claims**4)  Claim(s) 1-25 is/are pending in the application.4a) Of the above, claim(s) 2-5 and 14 is/are withdrawn from consideration.5)  Claim(s) \_\_\_\_\_ is/are allowed.6)  Claim(s) 1, 6-13, and 15-25 is/are rejected.7)  Claim(s) \_\_\_\_\_ is/are objected to.8)  Claims \_\_\_\_\_ are subject to restriction and/or election requirement.**Application Papers**9)  The specification is objected to by the Examiner.10)  The drawing(s) filed on \_\_\_\_\_ is/are a)  accepted or b)  objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)  The proposed drawing correction filed on \_\_\_\_\_ is: a)  approved b)  disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)  The oath or declaration is objected to by the Examiner.**Priority under 35 U.S.C. §§ 119 and 120**13)  Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).a)  All b)  Some\* c)  None of:1.  Certified copies of the priority documents have been received.2.  Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.3.  Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\*See the attached detailed Office action for a list of the certified copies not received.

14)  Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).a)  The translation of the foreign language provisional application has been received.15)  Acknowledgement is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.**Attachment(s)**1)  Notice of References Cited (PTO-892)4)  Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_2)  Notice of Draftsperson's Patent Drawing Review (PTO-948)5)  Notice of Informal Patent Application (PTO-152)3)  Information Disclosure Statement(s) (PTO-1449) Paper No(s). 7, 96)  Other: \_\_\_\_\_

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1) Claims 1 to 25 are pending in the instant application.

2) Claims 2 to 5 and 14 are withdrawn from further consideration pursuant to 37

CFR 1.142(b), as being drawn to a nonelected invention, there being no allowable generic or linking claim. Applicant timely traversed the restriction (election) requirement in Paper No. 10, filed 19 April of 2002. The traversal is on the ground(s) that a search of the art for a hybrid arrest molecule would be coextensive with a search of the art for a hybrid G protein-coupled receptor. This is not found persuasive because G protein-coupled receptors and arrestin molecules are structurally unrelated and a search of the art for both of these alternative inventive concepts in a single application would clearly present an undue burden.

The requirement is still deemed proper and is therefore made FINAL.

3) Claims 16 to 20 and 25 are objected to as depending from a non-elected base claim. This issue was brought to Applicant's attention in Paper Number 8. If the dependency of these claims is not corrected then they will be withdrawn from further consideration as being drawn to a nonelected invention in the next office action.

4) Claims 1, 6 to 13 and 15 to 25 are generic to a plurality of disclosed patentably distinct species of modified arrestins. Applicant is required under 35 U.S.C. 121 to elect a single disclosed species of modified arrestin for further prosecution on the merits, even though this requirement is traversed.

Should applicant traverse on the ground that the species are not patentably distinct, applicant should submit evidence or identify such evidence now of record showing the species to

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be obvious variants or clearly admit on the record that this is the case. In either instance, if the examiner finds one of the inventions unpatentable over the prior art, the evidence or admission may be used in a rejection under 35 U.S.C. 103(a) of the other invention.

5) The instant specification does not comply with 37 C.F.R. § 1.84(U)(1), which states that partial views of a drawing which are intended to form one complete view, whether contained on one or several sheets, must be identified by the same number followed by a capital letter. Figures 10B, 11B, 12B and 13B are each presented on multiple panels which are not properly numbered. For example, each of the nine sheets of drawings which make up Figure 10B should be numbered 10B to 10J, respectively. Applicant is reminded that once the drawings are changed to meet the separate numbering requirement of 37 C.F.R. § 1.84(U)(1), Applicant is required to file an amendment to change the Brief Description of the Drawings and the rest of the specification accordingly.

6) The drawings in the instant application do not comply with 37 C.F.R. § 1.821(d), which requires a reference to a particular sequence identifier (SEQ ID NO:) be made in the specification and claims wherever a reference is made to that sequence. M.P.E.P. 2422.02 expressly states that “when a sequence is presented in a drawing, regardless of the format or the manner of presentation of that sequence in the drawing, the sequence must still be included in the Sequence Listing and the sequence identifier (“SEQ ID NO:X”) must be used, either in the drawing or in the Brief Description of the Drawings”.

The following is a quotation of the first paragraph of 35 U.S.C. 112:

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The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

7) Claims 1, 6 to 13 and 15 to 25 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. A critical element of the disclosed invention is the requirement that each member of a pair of interacting proteins be fused to one member of a pair of complementary  $\beta$ -galactosidase mutants. It is only when both members of that pair of complementary  $\beta$ -galactosidase mutants are brought together through protein-protein interaction that an enzymatic activity is produced. The association of a chimeric protein "comprising one mutant form of a reporter enzyme" with a ligand-activated G protein-coupled receptor **will not produce an enzymatic activity** if that G protein-coupled receptor does not contain a **complementary form** of that mutant enzyme. The invention, as claimed, is inoperable.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

8) Claims 16, 17, 24 and 25 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

8.1) Claims 16, 17 and 25 are vague and indefinite because there is no antecedent basis for "said modified arrestin" in claim 14, from which this claim depends.

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8.2) Claim 24 is vague and indefinite because there is no antecedent basis for "said  $\beta$ -arrestin 2".

35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

9) Claims 1, 6 to 13 and 15 to 25 are rejected under 35 U.S.C. 101 because the disclosed invention is inoperative for those reasons given in section 7 above and therefore it lacks utility.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

10) Claims 1, 6 to 13 and 15 to 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over the Blau et al. patent (6,342,345 B1) in view of the Barak et al. patent (5,891,646, cited by Applicant) the Kovoor et al. publication (J. Biol. Chem. 274(11):6831-6834, 12 Mar. 1999, cited by Applicant), the Gurevich et al. '95 publication (J. Biol. Chem. 270(2):720-731, 13 Jan. 1995, cited by Applicant) and the Gurevich et al. '97 publication (Mol. Pharm. 51:161-169, 1997). The Blau et al. patent described a system for the detection of the molecular interaction between two proteins in an intact cell by expressing each of those proteins as a fusion

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protein comprising one member of a pair of complementary β-galactosidase mutants. In the first paragraph under “DISCLOSURE OF THE INVENTION”, Blau et al. taught “methods and compositions for detecting, assaying and quantitating molecular interactions within living cells and in vitro, through complementation between two or more low affinity reporter subunits” which “enables, for the first time, the study of protein-protein interactions and their control in mammalian cells without reliance upon the transcriptional activation of a reporter gene construct”. The following paragraph further taught that “[i]nteractions occurring within the nucleus of the cell, interactions occurring in the cytoplasm, on the cell surface, within or on the surface of organelles, or between cytoplasmic and surface (either cellular or organellar) molecules, as well a[s] interactions occurring outside the cell, are capable of being detected” by employing the method described therein. Example 11 of this patent, as illustrated in Figure 7a, specifically taught the application of the system described therein to the detection of receptor activation. The Blau et al. patent does not anticipate the instant invention only because it does not limit the method described therein to the detection of the interaction of a G protein-coupled receptor with other proteins such as β-arrestin.

The Barak et al. patent described a method of identifying compounds which act as ligands (abstract), agonists (ln. 53, colm. 2) and antagonists (ln. 12, colm. 3) of a selected G protein-coupled receptor by indirectly measuring the ligand-induced association of that receptor with a fluorescent labeled β-arrestin molecule as indicated by the accumulation of the labeled β-arrestin at the cell surface, where the receptor is located. This patent clearly taught the identification of G

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protein-coupled receptor agonists and antagonists by detecting the binding of a G protein-coupled receptor to β-arrestin in response to the activation of that receptor by an agonist. An artisan of ordinary skill in the art of molecular biology would have recognized that the method of Barak et al. was limited by the fact that it did not allow detection of the direct interaction of the fluorescent labeled β-arrestin employed therein with a specific G protein-coupled receptor. That artisan would have realized that the fluorescent labeled β-arrestin would have accumulated at the cell membrane in response to the activation of any G protein-coupled receptor which might be present in the cell. This concern was addressed in Example 6 of Barak et al., which demonstrated the colocalization of an antibody-labeled β<sub>2</sub> adrenergic receptor with the fluorescent labeled β-arrestin upon exposure of the cell to the adrenergic receptor agonist isoproterenol. Therefore, that artisan would have appreciated the fact that an accurate measurement of the ligand activation of a particular receptor by employing the method of Barak et al. would require the inclusion of a control consisting of a cell which is otherwise identical to the test cell except for the absence of the receptor of interest. That artisan would have understood that the method of detecting protein-protein interaction that was described by Blau et al. would not have required such a control because it measured the direct interaction of two specific proteins and, therefore, would allow one to measure the direct interaction of β-arrestin with a specific G protein-coupled receptor in an intact cell irrespective of the interaction of β-arrestin with any other G protein-coupled receptor which might be present in that cell. Therefore, that artisan would have found it *prima facie* obvious to have employed the β-galactosidase complementation system of Blau et al.

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to detect the interaction of  $\beta$ -arrestin with a particular G protein-coupled receptor to identify agonists and antagonists thereto as taught by Barak et al. because that artisan would have been more confident that the results obtained by the method of Blau et al. were representative of the action of the particular receptor of interest.

Further, the Barak et al. patent taught that  $\beta$ -arrestin binds to a ligand-activated G protein-coupled receptor only after that receptor has been phosphorylated by a G protein-coupled receptor kinase (GRK). Therefore, the assay system of Barak et al. requires the presence of the receptor of interest, a labeled arrestin molecule capable of binding to that receptor after that receptor has been activated and phosphorylated by a GRK, and a GRK capable of phosphorylating the receptor of interest once that receptor has been activated by a test compound. The Kovoor et al. publication described the construction of two  $\beta$ -arrestin mutants which were capable of binding to a ligand-activated G protein-coupled receptor in a phosphorylation independent manner. Therefore, one of ordinary skill in the art of molecular biology would have found it *prima facie* obvious to have employed a phosphorylation independent  $\beta$ -arrestin of Kovoor et al. in the receptor assay method of Barak et al. to eliminate the need for the presence of a GRK in the assay system and to thereby simplify that system by reducing the number of elements needed to measure receptor activation.

The Gurevich et al. '95 and the Gurevich et al. '97 publications have been cited because they each described a variety of mutations which could be made to arrestins to render them either phosphorylation independent or to give them a higher affinity for a particular ligand-activated G

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protein-coupled receptor. To have employed a modified arrestin having a higher affinity for ligand-activated receptor, either phosphorylated or unphosphorylated, in the assay of Barak et al. to improve the sensitivity of that assay would have been *prima facie* obvious to one of ordinary skill in the art in view of this combination of references.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to John D. Ulm whose telephone number is (703) 308-4008. The examiner can normally be reached on Monday through Friday from 9:00 AM to 5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Yvonne Eyler can be reached at (703) 308-6564.

Official papers filed by fax should be directed to (703) 308-4242 or (703) 872-9306. Official responses under 37 C.F.R. § 1.116 should be directed to (703) 872-9307.

Any inquiry of a general nature or relating to the status of this application should be directed to the Group receptionist whose telephone number is (703) 308-0196.



JOHN ULM  
PRIMARY EXAMINER  
GROUP 1800